Robust Electrical Contacts for Sensors and Electronics in Space Flight

Completed Technology Project (2011 - 2015)

Project Introduction

Space flight electronics and sensors require electrical contacts that possess long operational lifetimes at high temperatures. High temperature sensors and their associated electronics are needed for monitoring chamber pressures during spacecraft engine burns. Similarly, spacecraft traveling to Venus, Mars, and other harsh terrains require durable sensors and electronics for entry, descent, and landing. For these applications, the semiconductor silicon carbide has attracted great attention because of its superior operation at high temperatures and in harsh environments compared to other semiconductors. Recently at NASA, thermally-stable pseudoamphoteric ohmic contacts to both n- and p-type silicon carbide have been developed. These composite contacts are not yet fully characterized or understood, and they could be further engineered to create even more robust, longer lasting silicon carbide devices with great reduction in processing time and costs. Simulations of current transport in these composite contacts as well as imaging using transmission electron microscopy will allow for a better understanding of how they work and how to further improve them. Long-term electrical testing at high temperatures will then demonstrate the performance of this next generation of electrical contacts. This research would benefit greatly from resources at both The Pennsylvania State University and the NASA Glenn Research Center. Penn State has excellent microscopy and materials characterization equipment, while the NASA site has expertise in silicon carbide electronics and sensors as well as dedicated electrical testing equipment. Using robust pseudoamphoteric contacts in high-temperature silicon carbide devices and sensors could help expand the human and robotic presence in space by expanding the lifetime of electronics for missions.

Anticipated Benefits

Using robust pseudoamphoteric contacts in high-temperature silicon carbide devices and sensors could help expand the human and robotic presence in space by expanding the lifetime of electronics for missions.

Project Image Robust Electrical Contacts for Sensors and Electronics in Space Flight

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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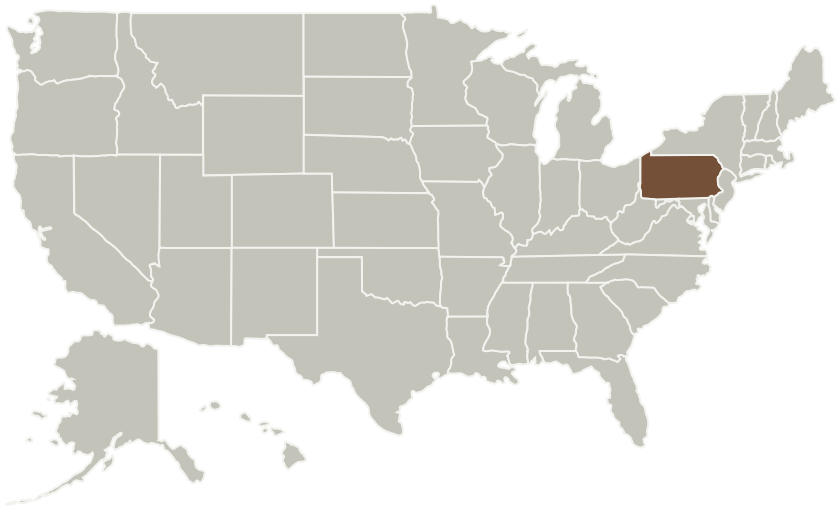
Primary U.S. Work Locations and Key Partners



Primary U.S. Work Locations
Pennsylvania

Images

4267-1363263969645.jpg
Project Image Robust Electrical Contacts for Sensors and Electronics in Space Flight
(https://techport.nasa.gov/image/1816)

Project Management

Program Director:
Claudia M Meyer

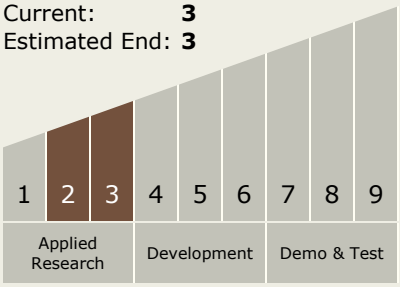
Program Manager:
Hung D Nguyen

Principal Investigator:
Suzanne Mohney

Co-Investigator:
Katherine C Kragh-buetow

Technology Maturity (TRL)

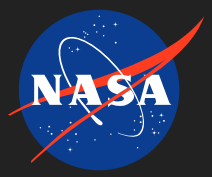
Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.4 Contact-less / Wearable Human Health and Performance Monitoring



Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html